

# Biomass Gasifiers

## New technology fuels high-efficiency power generation from biomass

The world's first demonstration of an efficient, low-pressure biomass gasifier capable of producing a high-quality fuel is now operating in Vermont. The gasifier converts 200 tons of solid biomass per day into a clean-burning gas with a high energy content for electricity generation. The U.S. Department of Energy's (DOE's) Office of Power Technologies (OPT) supports the development of components for the gasifier and underwrites part of the costs of the demonstration.

This biomass gasifier demonstration represents a major technical advance and opportunity for the biopower industry because gasifiers can be connected to advanced, highly efficient power systems. Currently, biomass is the (non-hydro) renewable energy technology with the largest generating capacity—about 7000 megawatts (MW)—operating throughout the United States. These systems use conventional steam turbines, generating

electricity at efficiencies that are typically less than 20%. By the year 2000, the system will be able to achieve efficiencies double those of today's biopower industry when the new gasifier is connected to a combined-cycle gas turbine.

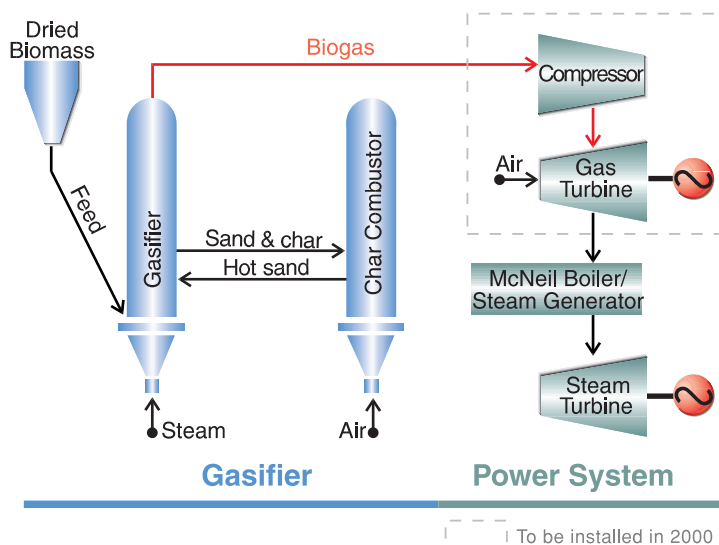
The biomass gasifier heats the wood in a chamber filled with hot sand until the wood breaks into its constituent chemical components. The solids, sand and char, are separated from the constituent gases, which then flow through a scrubber. The final result is a very clean-burning gas fuel with a medium-Btu content (500 Btu/ft<sup>3</sup>).

Because the gas is cleaned before combustion, and because wood has a low nitrogen and sulfur content, the controlled emissions (like SO<sub>x</sub> and NO<sub>x</sub>) are extremely low. Furthermore, emissions of greenhouse gases (CO<sub>2</sub>) are greatly reduced because the

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### Highlights

- **Demonstrates high efficiency and low emissions**
- **Key step in reducing technical risk toward commercialization**
- **Expands opportunities for biopower in domestic and international markets**
- **Uses locally plentiful wood feedstocks: forest tree-stand improvements, construction, and industrial wood residues**
- **Garners prestigious R&D 100 Award as one of the one-hundred most significant technological achievements in 1998.**



*The Battelle biomass gasifier can fuel advanced, highly efficient power systems, such as a combined-cycle gas turbine scheduled to be installed in Burlington, Vermont in the year 2000.*

# Biomass Gasifiers

*By producing  
clean electricity  
from renewable  
biomass,  
gasifier systems  
hold the  
promise of  
new markets  
for both  
farmers and  
power  
producers.*

biomass is grown and harvested in a sustainable way. Roughly the same amount of CO<sub>2</sub> that is released during combustion is absorbed by trees and crops when they grow.

In addition to providing clean energy, gasifiers greatly increase the number and types of biomass fuels suitable for power systems. In the future, these systems might be powered by energy crops grown specifically for power production. Another promising market is for combined heat and power systems in the forest products industry. Several scenarios point to the potential market for gasifier power systems at about 10,000 MW by the year 2010—enough electricity for 10 million households.

Because of its economic potential and scientific accomplishment, the biomass gasifier was given the R&D 100 Award for being one of the most significant technical achievements in 1998. The award is shared by Battelle Columbus Laboratory for licensing the technology; the Future Energy Resources Company of Atlanta, Georgia, for developing the project; the National Renewable Energy Laboratory (NREL) for support of design and engineering; and the Burlington Electric Department of Burlington, Vermont, for integrating the gasifier into the McNeil

Generating Station. Today, Battelle and NREL, with OPT support, will continue developing this new biomass gasifier technology for efficient and ultra-low emissions power technologies of the future.



NREL/PIX 04744

*The first demonstration of Battelle's biomass gasifier capable of generating clean, renewable electricity from advanced power systems is under way in Burlington, Vermont.*

## Project Partners

U.S. Department of  
Energy

Battelle Columbus  
Laboratory

Future Energy  
Resources Company

The Burlington Electric  
Department

National Renewable  
Energy Laboratory

### For More Information:

Visit the Biopower Web site of the U.S. Department of Energy's Biomass Power Program: [www.eren.doe.gov/biopower](http://www.eren.doe.gov/biopower)

See "Growing America's Energy" on your public television station, or order the video from:

Energy Efficiency and Renewable  
Energy Clearinghouse (EREC)  
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